

CLAIMS

1. A display panel manufacturing method, the display panel including an element substrate with electroluminescent elements formed thereon and a sealing substrate bonded to the element substrate at a peripheral panel bonding part thereof for sealing a space over the element substrate, comprising the steps of:

forming a frame-shaped groove on the panel bonding part of the sealing substrate,

forming a frame-shaped glass paste layer by introducing a paste including a low melting point glass powder and a solvent into the groove,

conducting a thermal processing by volatilizing the solvent contained in the glass paste layer to provide a low melting point glass frame,

forming a low heat resistant layer on the surface of the sealing substrate, the low heat resistant layer made of a material having a heat resistant temperature lower than the temperature of the thermal processing, and

with the element substrate arranged to face the sealing substrate at a predetermined distance, sealing a space between the element substrate and the sealing substrate by directing a laser beam to the low melting point glass frame to heat and melt the low melting point glass, so that the low melting point glass is raised towards the element and the two substrates are welded together along the peripheries thereof by the raised glass.

2. A display panel manufacturing method according to claim 1, wherein

the step of forming the glass paste layer includes

introducing the glass paste into the frame-shaped groove in an amount exceeding the volume of the groove, and

the method further includes, after volatilizing the solvent in the thermal processing, flattening the surface of the bonding part of the sealing substrate by removing a part of the low melting point glass frame extending over the surface of the sealing substrate.

3. A display panel manufacturing method according to claim 1, wherein

the low heat resistant layer formed in the step of forming the low heat resistant layer is at least one of a color filter, a resinous black matrix, a polarizer, and a phase plate.

4. A display panel manufacturing method according to claim 1, wherein

in the flattening step, the low melting point glass frame extending over the surface of the sealing substrate is removed by polishing.

5. A display panel manufacturing method according to claim 1, wherein

in the flattening step, the low melting point glass frame extending over the surface of the sealing surface is removed to make the surface irregularities of the bonding part of the sealing substrate to not more than 1/10 of the film thickness of the low heat resistant layer which is formed subsequent to the flattening step.

6. A display panel manufacturing method according to claim 1, wherein

the groove formed in the groove forming step has a tapered cross section, with the width of the groove gradually narrowing from the surface of the sealing substrate towards the bottom of the groove.

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7. A display panel manufacturing method according to claim 1, wherein

the bottom part of the groove formed in the groove forming step has a smoothly curved cross section.

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8. A display panel comprising an element substrate with electroluminescent elements formed thereon and a sealing substrate which is bonded to the element substrate at a peripheral panel bonding part thereof for sealing a space over the element substrate, wherein

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the element substrate and the sealing substrate are sealed and welded together along the peripheries thereof with a low melting point glass, and

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a portion of the low melting point glass is introduced into a frame shaped groove formed in the sealing substrate.

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9. A display panel according to claim 8, wherein at least one of a color filter, a resinous black matrix, a polarizer, and a phase plate is provided on the surface of the sealing substrate facing the element substrate.

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10. A display panel according to claim 8, wherein the groove has a tapered cross section, with the width gradually narrowing from the surface of the sealing substrate towards the bottom of the groove.

11. A display panel according to claim 8, wherein

the bottom of the groove has a smoothly curved cross section.

12. A display panel according to claim 8, wherein
in the direction of the width of the groove, the thickness
5 of the low melting point glass used for bonding the element
substrate to the sealing substrate is less than the width of
the groove.